What is claimed is:

1. A compound comprising a ligand that specifically reacts with a first receptor not naturally present in mammals, wherein the compound further comprises a molecular cage covalently bound to the ligand that prevents reaction of the ligand with the first receptor, wherein the ligand is released from the cage and capable of reacting with the first receptor upon exposure of the compound to light.

2. The compound of claim 1, wherein the first receptor is an ecdysone receptor.

3. The compound of claim 1, wherein the ligand is a steroid.

4. The compound of claim 1, wherein the ligand is an inhibitor of the first receptor.

5. The compound of claim 2, wherein the ligand is selected from the group consisting of ecdysone, 20-hydroxyecdysone, ponasterone A, muristerone A, inokosterone, *3,5*-di-*tert*-butyl-4-hydroxy-N-isobutyl-benzamide and a dibenzoylhydrazine.

6. The compound of claim 1, wherein the molecular cage is a nitromethoxybenzyl moiety.

7. The compound of claim 6, wherein the nitromethoxybenzyl moiety is 1-methyl-4,5-dimethoxy-2-nitrobenzene.

8. The compound of claim 7, wherein the compound is 4 of FIG. 1.

9. The compound of claim 1, wherein the light comprises wavelengths at 300-400 nm.

10. The compound of claim 9, wherein the light comprises wavelengths at 325-375 nm.

11. The compound of claim 1, wherein the molecular cage is a two-photon cage.

12. A cell of a species, wherein the cell is transfected with a gene of interest and a gene encoding a first receptor, the gene of interest operably linked to a genetic element capable of being induced by the first receptor when bound to a ligand, and the first receptor not naturally present in the species,

the cell further comprising a compound comprising the ligand and a molecular cage covalently bound to the ligand that prevents reaction of the ligand with the first receptor, wherein the ligand is released from the cage and capable of reacting with the first receptor upon exposure of the compound to light.

13. The cell of claim 12, wherein the cell is prokaryotic.

14. The cell of claim 12, wherein the cell is eukaryotic.

15. The cell of claim 14, wherein the cell is part of a living multicellular organism.

16. The cell of claim 15, wherein substantially all of the cells of a cell type in the

organism are transfected with the gene of interest and the first receptor.

17. The cell of claim 15, wherein substantially all of the cells in the organism are transfected with the gene of interest and the first receptor.

18. The cell of claim 14, wherein the cell is an animal cell.

19. The cell of claim 18, wherein the cell is a mammalian cell.

20. The cell of claim 16, wherein the cell is a human cell.

21. The cell of claim 14, wherein the cell is a plant cell.

22. The cell of claim 12, wherein the first receptor is an ecdysone receptor.

23. The cell of claim 12, wherein the gene of interest encodes an untranslated RNA.

24. The cell of claim 23, wherein the untranslated RNA is selected from the group consisting of an antisense RNA, an aptamer, and an siRNA.

25. The cell of claim 12, wherein the gene of interest encodes a protein selected from the group consisting of an apoptosis-inducing protein, a protein comprising an apoptosis-inducing protein, a protein comprising an antibody binding domain, an angiogenic factor, a cytokine, a viral receptor, a blood protein, a transcription factor, a structural protein, a viral protein, a bacterial protein, a recombinase, an extracellular protein, a protein already present in the cell, and an engineered protein with no natural counterpart.

26. The cell of claim 12, wherein the gene of interest encodes a Cre recombinase, and wherein the cell further comprises a target sequence flanked by two *loxP* sites, wherein the target sequence is eliminated from the cell when the Cre recombinase is induced.

27. The cell of claim 26, wherein the target sequence comprises a promoter, the promoter operably linked to a target gene.

28. The cell of claim 27, wherein the target gene is within the target sequence.

29. The cell of claim 26, wherein the target sequence is 3' from a genetic element, such that when the target sequence is eliminated by the Cre recombinase, the genetic element becomes operably linked to a second gene of interest.

30. The cell of claim 29, wherein the second gene of interest encodes an untranslated RNA.

31. The cell of claim 30, wherein the untranslated RNA is selected from the group consisting of an antisense RNA, an aptamer, and an siRNA.

32. The cell of claim 29, wherein the second gene of interest is a gene encoding a protein selected from the group consisting of an apoptosis-inducing protein, a protein comprising an apoptosis-inducing protein, a protein comprising an antibody binding domain,

an angiogenic factor, a cytokine, a blood protein, a transcription factor, a structural protein, a viral protein, a bacterial protein, a viral receptor, an extracellular protein, a protein already present in the cell, and an engineered protein with no natural counterpart.

33. The cell of claim 27, wherein the promoter is inducible.

34. The cell of claim 27, wherein the promoter is constitutive.

35. The cell of claim 25, wherein the target sequence is a target gene.

36. The cell of claim 35, wherein the target gene encodes an untranslated RNA.

37. The cell of claim 36, wherein the untranslated RNA is selected from the group consisting of an antisense RNA, an aptamer, and an siRNA.

38. The cell of claim 35, wherein the target gene is a gene encoding a protein selected from the group consisting of an apoptosis-inducing protein, a protein comprising an antibody binding domain, an angiogenic factor, a cytokine, a blood protein, a transcription factor, a structural protein, a viral protein, a bacterial protein, a viral protein, an extracellular protein, a protein already present in the cell, and an engineered protein with no natural counterpart.

39. The cell of claim 26, wherein the target sequence comprises a stop codon.

40. The cell of claim 12, wherein the gene of interest encodes a viral receptor, the viral receptor allowing entry of a viral vector into the cell.

41. The cell of claim 40, wherein the viral receptor is a TVA receptor for subgroup A avian leucosis virus and the viral vector is a subgroup A avian leucosis virus vector.

42. The cell of claim 40, wherein the cell has been exposed to light and a viral vector expressing a second gene of interest, wherein the viral vector has infected the cell and expresses the second gene of interest.

43. The cell of claim 42, wherein the second gene of interest is a gene encoding a protein selected from the group consisting of an apoptosis-inducing protein, a protein comprising an apoptosis-inducing protein, a protein comprising an antibody binding domain, an angiogenic factor, a cytokine, a blood protein, a transcription factor, a structural protein, a viral protein, a bacterial protein, an extracellular protein, a protein already present in the cell, and an engineered protein with no natural counterpart.

44. The cell of claim 42, wherein the second gene of interest encodes an untranslated RNA.

45. The cell of claim 44, wherein the untranslated RNA is selected from the group consisting of an antisense RNA, an aptamer, and an siRNA.

46. The cell of claim 12, wherein the compound comprises a ligand of an ecdysone

receptor.

47. The cell of claim 12, wherein the light comprises wavelengths at 325-375 nm.

48. The cell of claim 12, wherein the light comprises wavelengths at about 700 nm.

49. The cell of claim 12, wherein the molecular cage is a nitromethoxybenzyl moiety.

50. The cell of claim 49, wherein the nitromethoxybenzyl moiety is 1-methyl-4,5-dimethoxy-2-nitrobenzene.

51. The cell of claim 49, wherein the molecular cage is a two-photon cage.

52. The cell of claim 12, wherein the gene of interest and the gene encoding a first receptor are transfected into the cell with a viral vector.

53. The cell of claim 12, wherein the gene of interest and the gene encoding a first receptor are transfected into the cell with a plasmid vector.

54. The cell of claim 12, wherein the gene of interest and the gene encoding a first receptor are transiently expressed.

55. The cell of claim 12, wherein the gene of interest and the gene encoding a first receptor are stably expressed.

56. The cell of claim 12, wherein the gene of interest and the gene encoding a first receptor are maintained extrachromosomally in the cell.

57. The cell of claim 12, wherein the gene of interest and the gene encoding a first receptor are integrated into a chromosome of the cell.

58. A method of expressing a gene of interest in a cell of a species, the method comprising

creating the cell of a species of claim 12 by

transfecting the cell with the gene of interest and a gene encoding a first receptor, the gene of interest operably linked to a genetic element capable of being induced by the first receptor when bound to a ligand, the first receptor not naturally present in the species; and

adding a compound to the cell, the compound comprising the ligand and a molecular cage covalently bound to the ligand that prevents reaction of the ligand with the first receptor, the ligand capable of being released from the cage upon exposure of the compound to light; then

exposing the cell to light sufficient to release the cage from the ligand.

59. The method of claim 58, wherein the cell is part of a living multicellular organism.

60. The method of claim 59, wherein substantially all of the cells of a cell type in the

organism are transfected with the gene of interest and the first receptor.

61. The method of claim 59, wherein substantially all of the cells in the organism are transfected with the gene of interest and the first receptor.

62. The method of claim 58, wherein the light comprises wavelengths at 300-400 nm.

63. The method of claim 59, wherein the light comprises wavelengths at 325-375 nm.

64. The method of claim 58, wherein the light comprises wavelengths at about 700 nm.

65. The method of claim 58, wherein the gene of interest and the gene encoding a first receptor are transfected into the cell with a viral vector.

66. The method of claim 58, wherein the gene of interest and the gene encoding a first receptor are transfected into the cell with a plasmid vector.

67. A method of expressing a second gene of interest in a cell of a species, the method comprising

transfecting the cell with a first gene of interest and a gene encoding a first receptor,

the first gene of interest encoding a viral receptor, the viral receptor allowing entry of a viral vector into the cell,

the first gene of interest operably linked to a genetic element capable of being induced by the first receptor when bound to a ligand, the first receptor not naturally present in the species,

the ligand further comprising a molecular cage covalently bound to the ligand that prevents reaction of the ligand with the first receptor, wherein the ligand is released from the cage and capable of reacting with the first receptor upon exposure of the compound to light;

exposing the cell to the viral vector further comprising an expressible gene encoding the second gene of interest; then

exposing the cell to light sufficient to release the cage from the ligand, allowing the ligand to react with the first receptor, directing expression of the viral receptor and allowing infection of the cell by the viral vector; then

expressing the second gene of interest.

68. The method of claim 67, wherein the viral receptor is a TVA receptor for subgroup A avian leucosis virus and the viral vector is a subgroup A avian leucosis virus.

69. The method of claim 67, wherein the first receptor is an ecdysone receptor.

70. The method of claim 67, wherein the ligand is a steroid.

71. The method of claim 69, wherein the ligand is selected from the group consisting of ecdysone, 20-hydroxyecdysone, ponasterone A, muristerone A, inokosterone, *3,5*-di-*tert*-butyl-4-hydroxy-N-isobutyl-benzamide and a dibenzoylhydrazine.

72. The method of claim 67, wherein the second gene of interest is operably linked to an inducible promoter.

73. The method of claim 67, wherein the second gene of interest is operably linked to a constitutive promoter.

74. The method of claim 67, wherein the second gene of interest is a gene encoding a protein selected from the group consisting of an apoptosis-inducing protein, a protein comprising an apoptosis-inducing protein, a protein comprising an antibody binding domain, an angiogenic factor, a cytokine, a blood protein, a transcription factor, a structural protein, a viral protein, a bacterial protein, an extracellular protein, a protein already present in the cell, and an engineered protein with no natural counterpart.

75. The method of claim 67, wherein the second gene of interest encodes an untranslated RNA.

76. The method of claim 75, wherein the untranslated RNA is selected from the group consisting of an antisense RNA, an aptamer, and an siRNA.

77. A method of repressing a gene of interest in a cell of a species, the method comprising

transfecting the cell with the gene of interest and a gene encoding a first receptor, the gene of interest operably linked to a genetic element capable of being repressed by the first receptor when bound to a ligand;

adding a compound to the cell, the compound comprising the ligand and a molecular cage covalently bound to the ligand that prevents reaction of the ligand with the first receptor, the ligand capable of being released from the cage upon exposure of the compound to light; then

exposing the cell to light sufficient to release the cage from the ligand.

78. The method of claim 77, wherein the first receptor is a transcriptional co-repressor.

79. The method of claim 77, wherein the first receptor is not naturally present in the species.

80. The method of claim 77, wherein the cell is prokaryotic.

81. The method of claim 77, wherein the cell is eukaryotic.

82. The method of claim 81, wherein the cell is part of a living multicellular organism.

83. The method of claim 82, wherein substantially all of the cells of a cell type in the organism are transfected with the gene of interest and the gene encoding a first receptor.

84. The method of claim 82, wherein substantially all of the cells in the organism are transfected with the gene of interest and the first receptor.

85. The method of claims 81, wherein the cell is an animal cell.

86. The method of claim 85, wherein the cell is a mammalian cell.

87. The method of claim 85, wherein the cell is a human cell.

88. The method of claim 81, wherein the cell is a plant cell.

89. The method of claim 77, wherein the gene of interest encodes an untranslated RNA.

90. The method of claim 89, wherein the untranslated RNA is selected from the group consisting of an antisense RNA, an aptamer, and an siRNA.

91. The method of claim 77, wherein the gene of interest encodes a protein selected from the group consisting of an apoptosis-inducing protein, a protein comprising an antibody binding domain, an angiogenic factor, a cytokine, a blood protein, a viral receptor, a transcription factor, a structural protein, a viral protein, a bacterial protein, an extracellular protein, a protein already present in the cell, and an engineered protein with no natural counterpart.

92. The method of claim 77, wherein the light comprises wavelengths at 300-400 nm.

93. The method of claim 77, wherein the light comprises wavelengths at 325-375 nm.

94. The method of claim 77, wherein the molecular cage is a nitromethoxybenzyl moiety.

95. The method of claim 94, wherein the nitromethoxybenzyl moiety is 1-methyl-4,5-dimethoxy-2-nitrobenzene.

96. The method of claim 77, wherein the molecular cage is a two-photon cage.

97. The method of claim 77, wherein the gene of interest and the gene encoding a first receptor are transfected into the cell with a viral vector.

98. The method of claim 77, wherein the gene of interest and the gene encoding a first receptor are transfected into the cell with a plasmid vector.

99. The method of claim 77, wherein the gene of interest and the gene encoding a first receptor are transiently expressed.

100. The method of claim 77, wherein the gene of interest and the gene encoding a

first receptor are stably expressed.

101. The method of claim 77, wherein the gene of interest and the gene encoding a first receptor are maintained extrachromosomally in the cell.

102. The method of claim 77, wherein the gene of interest and the gene encoding a first receptor are integrated into a chromosome of the cell.

103. A method of inducing elimination of a target sequence in a cell of a species, the method comprising

transfecting the cell with

a gene encoding a recombinase operably linked to a genetic element capable of being induced by a first receptor when bound to a ligand, wherein the first receptor is capable of inducing the genetic element when the first receptor reacts with a ligand; and

a gene encoding the first receptor;

adding a compound to the cell, the compound comprising the ligand and a molecular cage covalently bound to the ligand that prevents reaction of the ligand with the first receptor, the ligand capable of being released from the cage upon exposure of the compound to light; and

subsequently exposing the cell to light sufficient to release the cage from the ligand.

104. The method of claim 103, wherein the recombinase is a Cre recombinase, and wherein the cell is also transfected with two *loxP* sites flanking the target sequence.

105. The method of claim 103, wherein the first receptor is not naturally present in the species.

106. The method of claim 103, wherein the compound comprises a ligand that specifically reacts with a first receptor not naturally present in mammals, wherein the compound further comprises a molecular cage covalently bound to the ligand that prevents reaction of the ligand with the first receptor, wherein the ligand is released from the cage and capable of reacting with the first receptor upon exposure of the compound to light.

107. The method of claim 103, wherein the cell is prokaryotic.

108. The method of claim 103, wherein the cell is eukaryotic.

109. The method of claim 108, wherein the cell is part of a living multicellular organism.

110. The method of claim 109, wherein substantially all of the cells of a cell type in the organism are transfected with the gene of interest and the first receptor.

111. The method of claim 109, wherein substantially all of the cells in the organism are transfected with the gene of interest and the first receptor.

112. The method of claim 108, wherein the cell is an animal cell.

113. The method of claim 112, wherein the cell is a mammalian cell.

114. The method of claim 112, wherein the cell is a human cell.

115. The method of claim 108, wherein the cell is a plant cell.

116. The method of claim 103, wherein the target sequence encodes an untranslated RNA.

117. The method of claim 116, wherein the untranslated RNA is selected from the group consisting of an antisense RNA, an aptamer, and an siRNA.

118. The method of claim 103, wherein the target sequence encodes a protein selected from the group consisting of an apoptosis-inducing protein, a protein comprising an antibody binding domain, an angiogenic factor, a cytokine, a blood protein, a viral receptor, a transcription factor, a structural protein, a viral protein, a bacterial protein, an extracellular protein, a protein already present in the cell, and an engineered protein with no natural counterpart.

119. The method of claim 103, wherein the target sequence encodes a promoter.

120. The method of claim 103, wherein the elimination of the target sequence brings a promoter adjacent to a gene of interest such that the promoter is operably linked to the gene of interest.

121. The method of claim 120, wherein the target sequence encodes an untranslated RNA.

122. The method of claim 121, wherein the untranslated RNA is selected from the group consisting of an antisense RNA, an aptamer, and an siRNA.

123. The method of claim 120, wherein the target sequence encodes a protein selected from the group consisting of an apoptosis-inducing protein, a protein comprising an antibody binding domain, an angiogenic factor, a cytokine, a blood protein, a transcription factor, a structural protein, a viral protein, a bacterial protein, a viral receptor, an extracellular protein, a protein already present in the cell, and an engineered protein with no natural counterpart.

124. The method of claim 103, wherein the target sequence comprises a stop codon.

125. The method of claim 103, wherein the gene encoding a Cre recombinase, the two *loxP* sites, and the gene encoding a first receptor are transfected into the cell with a viral vector.

126. The method of claim 103, wherein the gene encoding a Cre recombinase, the two *loxP* sites, and the gene encoding a first receptor are transfected into the cell with a plasmid vector.

127. The method of claim 103, wherein the gene encoding a Cre recombinase, the two *loxP* sites, and the gene encoding a first receptor are transiently expressed.

128. The method of claim 103, wherein the gene encoding a Cre recombinase, the two *loxP* sites, and the gene encoding a first receptor are stably expressed.

129. The method of claim 103, wherein the gene encoding a Cre recombinase, the two *loxP* sites, and the gene encoding a first receptor are maintained extrachromosomally in the cell.

130. The method of claims 103, wherein the gene encoding a Cre recombinase, the two *loxP* sites, and the gene encoding a first receptor are integrated into a chromosome of the cell.

131. A kit for the conditional expression of a gene of interest in a cell, the kit comprising, in suitable containers, the compound of claim 1 and a vector comprising a gene encoding the first receptor.

132. The kit of claim 131, further comprising

a first vector comprising a gene encoding a viral receptor, the viral receptor allowing entry of a viral vector into a cell, and

the viral vector comprising a site for insertion of the gene of interest such that the gene of interest can be expressed when the viral vector infects the cell.

133. The kit of claim 132, wherein the viral receptor is a TVA receptor for subgroup A avian leucosis virus and the viral vector is a subgroup A avian leucosis virus.

134. The kit of claim 132, wherein the site for insertion of the gene of interest is operably linked to an inducible promoter.

135. The kit of claim 132, wherein the site for insertion of the gene of interest is operably linked to a constitutive promoter.

136. The kit of claim 131, wherein the cell is a mammalian cell.

137. The kit of claim 131, further comprising instructions for expressing the gene of interest in the cell transfected with the vector, and exposed to the compound and light.

138. A kit for the conditional elimination of a target sequence in a cell, the kit comprising, in suitable containers,

one or more vectors comprising

a gene encoding a recombinase operably linked to a genetic element capable of being induced by a first receptor when bound to a ligand, wherein the first receptor is capable of inducing the genetic element when the first receptor reacts with a ligand;

a gene encoding the first receptor; and

a compound comprising the ligand and a molecular cage covalently bound to the ligand that prevents reaction of the ligand with the first receptor, wherein the ligand is released from the cage and capable of reacting with the first receptor upon exposure of the compound to light.

139. The kit of claim 138, wherein the recombinase is a Cre recombinase.

140. The kit of claim 138, wherein the first receptor is an ecdysone receptor.

141. The kit of claim 138, wherein the ligand is a steroid.

142. The kit of claim 140, wherein the ligand is selected from the group consisting of ecdysone, 20-hydroxyecdysone, ponasterone A, muristerone A, inokosterone, *3,5*-di-*tert*-butyl-4-hydroxy-N-isobutyl-benzamide and a dibenzoylhydrazine.

143. The kit of claim 138, further comprising instructions for using the kit to eliminate a target sequence in cells transfected with the vectors and exposed to the compound and to light.